REMARKS

FORMAL MATTERS:

Claims 1, 4, 5, 7, 8 and 11-14 are pending after entry of the amendments set forth herein.

Claims 2, 3, 6, 9 and 10 are canceled without prejudice.

Claims 1, 7 and 12 are amended. The amendments to claims 1 and 12 are supported within previously pending now canceled claims 2, 3, 6, 9 and 10 and the figures and specification. Claim 7 has been amended in view of the cancellation of claim 6.

No new matter is added.

REJECTIONS UNDER §102

Claims 1-6 and 11-14 were rejected under 35 U.S.C. §102(e) as being anticipated by Besson (U.S. Patent No. 7,092,482).

The rejection is traversed as applied and as it might be applied to the presently pending claims. The Examiner will note that claim 1 is amended so that it includes the "preparing" step where the scatter mask is prepared based on a sum of a plurality of elemental scatter masks. Besson does not produce a plurality of elemental scatter masks which are then summed together. Thus, the rejection should be reconsidered and withdrawn.

REJECTIONS UNDER §103(A)

Claims 7-10 were rejected under 35 U.S.C. §103(a) as being unpatentable over Besson (U.S. Patent No. 7,092,482) in view of Dewaele (U.S. Patent No. 5,651,042)

The rejection is traversed as applied and as it might be applied to the presently pending claims.

As indicated above Besson does not teach the preparing step where a sum of a plurality of elemental scatter masks are used. There is nothing in Dewaele which would teach one skilled in the art to use the full field scatter function calculated in Besson and adapt it to produce a process as claimed within claim 1 or to obtain an imaging processing apparatus as claimed in claim 12. In view of such Applicants respectfully request reconsideration and withdrawal of the rejection.

FURTHER DISCUSSION OF REJECTIONS

It is submitted that the amendments to claim 1 patentably distinguish the invention over the cited prior art of Besson, and over a combination of the cited prior art of Besson with Dewaele, as will be explained below.

Besson is concerned with correcting an image for scatter in a radiographic system, including slot scanning systems, and thus is concerned with the same field and ultimate objective as the present invention. However, Besson achieves correction for scattering in a very different way, and in fact does not disclose the method of amended claims 1 or 12.

The first section of the specific description in Besson, more particularly up to column 15, line 52, is concerned with hardware adaptations to the apparatus to try to reduce the effects of scatter. Such measures include, for example, the relationship between the collimated beam and the detector, and the inclusion of anti-scatter grids.

The more relevant section of Besson is section 3 "*Scatter Compensation*" from column 15, line 53 to the end. This is concerned with mathematical processing of the image to correct for the effects of scatter. This section of the description carefully considers the different types of scattering (such as Rayleigh and Compton) and considers the path of the x-rays through the subject in order to derive a formula which gives the amount of scattered radiation arriving at any given point on the detector. He considers how the x-rays are attenuated as they pass through the subject (columns 19 and 20), the probability of x-rays being scattered (columns 21 and 22) and thus arrives in formula 20 with an expression for the amount of energy scattered into an annulus of radius dr located at a distance r from a given point M. He then needs to calculate how much radiation from that annulus arrives at pixel M on the detector (see column 23, lines 25 to 27), and then integrates this over all image rays (i.e. sums the contribution from all dr visible from M). This gives a "scatter mask", which is a formula which gives an estimate of the amount of scattered radiation arriving at a given detector position. This estimate is in terms of the intensity of the surrounding pixels.

Thus, in essence, Besson is describing in detail how to calculate a scatter mask. Such a mask can be calculated for any system, whether it is a slot-scanning system or not. In Besson if it is a slot scanning system, this would be taken into account in the integration which calculates how much energy is scattered into an elementary volume (in column 22, lines 20 to 35) and in the integration which calculates what contribution there is at a given detector position M from each of the elementary volume (the integration in Formula 21). Thus, the characteristics of the system are taken into account in the

basic calculation of the scatter mask. In essence the scatter mask which Besson calculates is specifically adapted to the system concerned.

The method of claim 1 and apparatus of claim 12 are directed to a different approach. The present inventors realized that a reasonable estimate of scatter in a slot scanning system can be arrived at by taking an existing full-field scatter mask and adapting it. Thus, the full field scatter mask which the present invention starts with could be a conventional one known for various types of apparatus (such as the point spread function illustrated in Figure 3 of the present application). This full field scatter mask is exactly the type of thing which is calculated by Besson.

But whereas Besson is interested in calculating the full field scatter mask specifically for the apparatus of concern, the present invention concerns taking an existing full field scatter mask and adapting it for the slot scanning operation. This is achieved by imagining a plurality of elemental scatter masks each corresponding to one exposure position of the slot scanning apparatus. To produce each elemental scatter mask areas which are not illuminated are set to zero. Each elementary scatter mask corresponds to one position of the beam and detector, thus to get the results of a whole scan the elemental scatter masks are summed together. This is the procedure illustrated schematically in Figure 8. In practice the same result is achieved by multiplying the original scatter mask (psf) by a piecewise linear function.

Therefore, with the present invention an adapted scatter mask is produced which represents the sum of a plurality of elementary scatter masks, with each element corresponding to a different beam and detector position. The elementary scatter mask for each position is a full field scatter mask which has been adapted by setting values to zero outside the field of illumination. Thus, the present invention avoids having to calculate a scatter mask from first principles as in Besson (for example by considering the path of an x-ray through the subject, all of the sources of scattering, the attenuation of the radiation through the subject, the geometry of the subject and apparatus and so on), but instead uses an already existing scatter mask and then adapts it. Thus, the present invention is concerned with additional steps once you already have a full field scatter mask such as that produced by the method of Besson. Besson does not include these further steps.

Referring specifically to the language of amended claim 1, firstly amended claim 1 states what is meant by a scatter mask, namely something which defines the contribution of scattered radiation at a given detector position in terms of the intensity at a plurality of surrounding detector positions. This is, of course, what Besson means by a scatter mask as well, but Besson is concerned with calculating this in

the first place, i.e. he finishes with it. The present invention is concerned with doing something further with it.

Claim 1 then goes onto specify the preparation of an adapted scatter mask which represents the sum of a plurality of elemental scatter masks. Besson does not produce a scatter mask by combining a plurality of elemental scatter masks. We note that the Examiner referred to three parts of Besson as perhaps disclosing forming a scatter mask from a plurality of elemental scatter masks. It is important to remember that a scatter mask is a function which defines the amount of scattered radiation at one detector position in terms of intensity of neighboring detector positions. Besson does not produce a plurality of elemental scatter masks which are then summed together. He does take into account a variety of different factors when calculating the scatter mask, but this is not the same as summing scatter masks together. In particular column 16, lines 6 to 11 refer to interpolation of scatter data. However, consideration of column 15, line 56 to column 16, line 6 reveals that Besson is utilizing a measurement of the amount of radiation in "*dark*" detector areas (i.e. outside the collimated beam) to provide a direct measurement of the amount of radiation being scattered. This dark area is positioned on both sides of the beam (see column 16, line 2). By interpolating across the beam he can arrive an estimate of the actual amount of radiation arriving at each position within the beam. Besson is therefore interpolating an actual measurement of scatter. This is not summing a plurality of elementary scatter masks, each of which is a function defining how much radiation arrives at one point from all of the neighboring points.

Column 18, lines 14 to 19 again refer to utilizing these "*scatter-only measurements*" by which Besson means the measurements of radiation in areas of the detector which should be dark. Again this is not a disclosure of summing a plurality of scatter masks.

Finally column 18, line 36 to column 25, line 60 discloses how the full field scatter mask is calculated from first principles, considering the various types of scattering and attenuation of the beam through the subject. Allowing for factors such as attenuation or different sorts of scattering is not the same as summing scatter masks.

Based on the above it can be clearly understood that claim 1 which now claims the specific step of preparing an adapted scatter mask representing the sum of a plurality of elements of scatter masks is not taught within Besson as taken alone or in combination with Dewaele. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

Claim 1 also specifies that each of the elemental scatter masks corresponds to a different exposure position of the beam and detector relative to the subject. Besson does not prepare a scatter

mask representing the sum of individual elemental scatter masks, each corresponding to a different position.

Finally, claim 1 specifies that the elemental scatter masks have values of the full field scatter masks set to zero outside the area of illumination. This is a simple step but, again, it is not present in Besson. Besson calculates his full field scatter mask by integration over all of the elemental volumes visible from a given position M. This feature of claim 1, though, in essence requires that integration already to have been done, and then sets values to zero afterwards.

The Examiner rejected original claim 1 as obvious from a combination of Besson and Dewaele. However, Dewaele is not concerned with correcting for scatter. Thus, there is nothing in Dewaele which would lead the skilled person to take the full field scatter function calculated in Besson and to adapt it as discussed above and as specified in claim 1. In fact, given that Besson proposes that the scatter function is calculated from first principles for the specific apparatus concerned, it does not need any further adaptation once it has been calculated. Thus, there would be no point in applying any further steps to the full field scatter mask of Besson because Besson's scatter mask is specifically calculated for the apparatus concerned. The present invention is based on the concept that a full field scatter mask can be adapted to a slot scanning apparatus in a simple way. Deweale does not add that concept to Besson.

Applicants would therefore be grateful if the Examiner could re-consider and withdraw the claim rejections in the light of the considerable amendments to the claims and the explanatory comments above.

CONCLUSION

Claims 1, 7 and 12 have been amended. Support for these amendments has been pointed out above. The cited art does not disclose the cited features of the claimed method or imaging processing apparatus. Specifically, the art does not teach producing a plurality of elemental scatter masks which are then summed together. In view of such reconsideration and withdrawal of the rejections are respectfully requested.

Applicant submits that all of the claims are in condition for allowance, which action is requested. If the Examiner finds that a telephone conference would expedite the prosecution of this application, please telephone the undersigned at the number provided.

The Commissioner is hereby authorized to charge any underpayment of fees associated with this communication, including any necessary fees for extensions of time, or credit any overpayment to Deposit Account No. 50-0815, order number KEMP-010.

Respectfully submitted,
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